

STAR 2006: NOAA Ship *David Starr Jordan* Weekly Science Report

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Science Summary: 12 - 18 October 2006

Each Thursday, we Cruise Leaders have the responsibility of summarizing the notable events of the past week. Because of their brief nature, these missives often read like one adventure piled on top of another. But life for those of us living out here is not always exciting. Indeed the data we collect, the questions we ponder, the synthesis of the ecological story out here, and the very wonder of this system are not complete without the vastness between patches, the emptiness between significant events, the norm as opposed to the unusual, the grinding tedium of the mundane. This week – the weather. Of the past seven days, mammal observers have looked through their high-powered binoculars for only three, with no effort on 3 consecutive days and mere minutes for the fourth. Sustained winds averaging 25 knots (and often gusting to much higher) day after day after day have tossed and scrambled the insides of the ship, precluded sleep or concentration, led to cancellation of net tow stations, XBTs, and even seabird effort! (2.5 knots was our maximum speed on Monday - too slow for any visual effort). The *coup de grace* came when our flyingfish Principal Investigator, obsessed with these organisms for 20 years now, cancelled the evening dipnet station during a 30 knot gale with 30 minutes yet to go, and was found some time later eating ice cream while staring at a movie (“I feel as though I’ve just witnessed the inflection point of Robert Pitman” a notable Visiting Scientist was heard to say). Gads it has been trying.

But, it has not been completely without event. In fact, we had two of them and both centered around “logs” – a generic term that suffices to encompass any item, natural or of anthropogenic origin, that is found floating on the ocean surface out here. It is one of the wonders of the oceanic tropics that, especially in the Pacific, especially in blue water, and especially far from land, entire communities aggregate around a floating object that can be as small as a single bird feather. The aggregations can be astounding, in both diversity and abundance. Clinging, creeping, floating, finning, and circling beneath these bits of structure can be barnacles, crabs, fishes at every size and level of the food chain, turtles, sharks, billfish, and certain species of dolphin. If the object is amenable, a booby or tern can often be seen standing on it (much preferred to sitting on the water for a rest, where a shark can come and bite off your lower end!). Among the more famous residents below these specks are predatory fishes. Out here, it is not all that uncommon for literally tons of tuna to be found associated with a several-foot-long two-by-four, and fishers of all sorts have long been aware of this fact. This phenomenon is the basis for the FADs – fish aggregation devices – that are deliberately planted on the ocean surface, left to accumulate their communities, then revisited (many have radar reflectors, or even satellite transmitters) and wrapped with nets to capture their valuable citizens. A single FAD can be used many times, for shortly after its tunas have gone into the hold of a commercial vessel, another school will have gathered beneath it again. Well aware of this phenomenon, the fishers amongst us were ready with their lines within moments of our spotting a 5 foot-long piece of bamboo with a Masked Booby standing on it early Saturday morning. Just over an hour later, we had 17 Mahi and 1 Wahoo on the back deck, and data on predatory fishes for our stable isotope and sexual dimorphism projects (as well as an exquisite lunch). Finding a log out here can be a real morale booster!

Yet the blessing of logs is also the curse. The communities for which they serve as a center do not distinguish between the good logs and the bad logs and early on Wednesday morning we found the latter - a “ghost net” parted with its owner months, perhaps years ago. Kept afloat by dozens of styrofoam buoys along a heavy line, these lost nets remain at the surface, continually attracting residents. Many (the

smaller fishes, barnacles, and crabs) are fortunate, for they would be destined to die as larvae out here in the open ocean, unsuccessfully searching for substrate on which to settle. But nets are designed to entangle larger organisms and, naively attracted to these “logs”, many are inadvertently captured and there they remain until they die - and long after. It is for this reason that, although in 25 knots of wind, everyone aboard was in support of launching the small boat to cut the floats off the net so that it could sink to the bottom. The 10 m or so length of monofilament netting that was brought back to the ship was tightly twisted into a 3-foot cylinder of tangled knots. Amidst that snarl we found perhaps a hundred dime- to quarter-sized crabs of various colors, 10s of small fishes (several of which now inhabit our aquarium), two brittle stars, and a 2-foot section of vertebral column that long ago belonged to a sizeable fish, perhaps a billfish. The piece of net that sank to the 3000 m ocean floor below took the body of a shark, and likely hundreds of additional crabs, small fishes, and who knows what else with it. It is a place of contrast – this oceanic Pacific.

Sightings and Effort Summary for Marine Mammals

Date	Start/ Stop Time	Position	Total nmi	Average Beaufort
101206	0909	N09:18.57 W099:15.05	26.3	5.2
	1534	N08:40.43 W099:48.67		
101306	---	---	0	*%\$@\$^&^\$
	---	---		
101406	0638	N05:38.13 W102:22.21	57.9	5.2
	1609	N06:34.26 W102:55.01		
101506	---	---	0	!*^%#@!*&
	---	---		
101606	---	---	0	*^&\$%!@#@
	---	---		
101706	---	---	0	*^%#(^!@!
	---	---		
101806	0717	N09:33.91 W107:16.29	5.2	5.9
	0909	N09:38.36 W107:09.87		

Code	Species	Number of Sightings
002	<i>Stenella attenuata (offshore)</i>	3
010	<i>Stenella longirostris orientalis</i>	4
013	<i>Stenella coeruleoalba</i>	2
017	<i>Delphinus delphis</i>	1
Total		10

Photography (Cornelia Oedekoven, Laura Morse, Adam Ü)

Well, however spectacular our last weekly report was, as unspectacular is this week’s. In fact, we can summarize it in one word: nothing! No cetacean pictures taken at all this week (sad).

Species Code	Species	This week	Total
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002	<i>Stenella attenuata (offshore)</i>	0	14
003	<i>Stenella longirostris (unid.)</i>	0	6
006	<i>Stenella attenuata graffmani</i>	0	11
010	<i>Stenella longirostris orientalis</i>	0	7
002/010	<i>St. l. orientalis/a (offshore)</i>	0	2
013	<i>Stenella coeruleoalba</i>	0	11
015	<i>Steno bredanensis</i>	0	11
017	<i>Delphinus delphis</i>	0	30
018	<i>Tursiops truncatus</i>	0	34
021	<i>Grampus griseus</i>	0	7
032	<i>Feresa attenuata</i>	0	1
036	<i>Globicephala macrorhynchus</i>	0	12
037	<i>Orcinus orca</i>	0	13*
046	<i>Physeter macrocephalus</i>	0	20*
049	<i>Ziphiid whale</i>	0	1
063	<i>Berardius bairdii</i>	0	3
072	<i>Balaenoptera edeni</i>	0	3
074	<i>Balaenoptera physalus</i>	0	2*
075	<i>Balaenoptera musculus</i>	0	21*
076	<i>Megaptera novaeangliae</i>	0	6*
090	<i>Stenella attenuata (unid.)</i>	0	1
099	<i>Balaenoptera borealis/edeni</i>	0	6

* Individual whales photographed

Biopsy (Juan Carlos Salinas Vargas and Ernesto Isaac Vázquez Morquecho)

Species	Common Name	# Weekly samples	# Weekly Takes	Total Samples	Total Takes
<i>Balaenoptera edeni</i>	Byrde's whale	0	0	4	4
<i>Balaenoptera musculus</i>	Blue whale	0	0	9	17
<i>Delphinus delphis</i>	Short-beaked common dolphin	0	0	19	40
<i>Globicephala macrorhynchus</i>	Short-finned pilot whale	0	0	62	137
<i>Megaptera novaeangliae</i>	Humpback whale	0	0	2	5
<i>Orcinus orca</i>	Killer whale	0	0	7	17
<i>Physeter macrocephalus</i>	Sperm whale	0	0	8	8
<i>Stenella attenuata</i>	Pantropical spotted dolphin	0	0	21	38
<i>Stenella attenuata graffmani</i>	Coastal spotted dolphin	0	0	27	42
<i>Stenella coeruleoalba</i>	Striped dolphin	0	0	2	8
<i>Stenella longirostris orientalis</i>	Eastern spinner dolphin	0	0	8	32
<i>Stenella longirostris subsp.</i>	unidentified spinner dolphin	0	0	25	42
<i>Steno bredanensis</i>	Rough-toothed dolphin	0	0	11	22
<i>Tursiops truncatus</i>	Bottlenose dolphin	0	0	48	78
		0	0	253	490

Seabirds and Marine Debris (Rich Pagen and Chris Cutler)

The term “Beaufort 6” (meaning winds between 22-27 knots) conjures up certain images in one’s mind: waves spraying over the bow, the crashing sound of pots sliding around in the galley, and the act of wedging oneself into bed at night to keep the ship’s motion from tossing you out onto the floor. The mammal observers have to go off effort in these conditions because the disturbed sea surface precludes adequate detection of animals, and because flipping head over heels and (finally) over the railing into the sea is a situation we are all interested in avoiding. The reality of a Beaufort 6 day is that the turbulent rollercoaster ride motion of the sea brought on by the wind actually only affects the sea surface. While we on the ship are holding onto a wall (OK, bulkhead) for stability while sweeping up shards of broken glass from a Pyrex dish that just toppled to its death, a fish several meters below the white caps or a bird soaring on the blasting wind is having a very different experience. In fact, a windy day (or in this case: a windy week) provides seabirds with a free bus pass, an easy downhill coast, or (perhaps quite literally) a free lunch. As seabirds often have to patrol huge areas of ocean in order to find even a single meal, the wind’s assistance is always welcome.

Being witness to a Juan Fernandez Petrel gracefully banking above the swell or a Leach’s Storm-petrel tiptoeing across the sea surface with 25 knots of wind in its face is certainly a highlight of these rough days. If it weren’t for these two species, we would have had little company out on the flying bridge this week. Even the landbird migration, which was a dominant theme of past weeks, has cooled way down as the calendar poises to turn its page to November (the strong southwesterly winds were probably also key players in keeping the landbirds on land). We did tally 20 species this week, with passing groups of Masked Boobies reminding us that we were within a few hundred miles of their largest colony on the planet: Clipperton Island. Male Brown Boobies with their washed out pale heads, also became a common sight around the ship later in the week.

Marine debris was largely absent from the offshore waters we plied this week, though one massive crow’s nest of monofilament drift net unfortunately made up for the otherwise “debris-free” water. Abandoned fishing gear can float undeterred at sea for years and in the process inadvertently trap and kill fish, turtles, birds and marine mammals. In rough conditions (did we have anything else this week?), the deck department launched the small boat to determine if there was anything we could do to rid the ocean of this hazard. Judging that there was too much net to retrieve and bring onboard to discard of, some of the net was cut free of its floats and sunk, while the rest was hauled aboard the ship. A close look at the net revealed a community of crabs, barnacles, and a few fanged blennies that had moved in and the skeleton of an unfortunate large fish. This strange juxtaposition illustrated the bizarre double-edged sword that human-made debris can be for marine life: death for some, life for others.

Turtle Operations (Lindsey Peavey, *et al.*)

An unprecedented week for STAR 2006 – few turtles seen, and zero turtles processed. With 20-30 knots of wind and Beaufort 6 or 7 everyday, small boat operations haven’t even been a consideration. I know it’s been a slow week when my turtle inflicted wounds have healed and I haven’t acquired any new ones to speak of. As we near the Mexican coast we will surely see turtle abundance and density skyrocket, and hopefully the weather lifts enough for us to squeeze in a few good days of turtling before pulling in to Acapulco.

This break in activity presents an opportunity to give an anticipated update on our satellite tagged turtle, “Ernesto.” We tagged this adult male olive ridley on 20 September off the coast of Nicaragua and he has since maintained a northwest course, now off the coast of El Salvador. I estimate he has traveled over

200 miles staying well off the continental shelf in waters 1,800-3,600 meters in depth. It is interesting to compare the part of his travels that parallel and overlap our Leg 3 survey trackline. Although we covered the particular area twenty-some days before “Ernesto,” we can suggest a few reasons why he may have chosen to visit, or at least is benefiting from, those particular waters. In the section of overlap, invertebrates from our dip netting and Manta and Bongo net tow samples consisted, in part, of *Physalia physalis* (“Portuguese-Man-of-War”), *Glaucus atlanticus* (a surface dwelling nudibranch), *Propita propita* (“blue button”), and various unidentified salps and jellies. Olive ridley stomach content samples throughout the survey have revealed lots of gelatinous substance; therefore “Ernesto” may very well be getting some snacks of late. During the five days or so that we steamed through the same area that “Ernesto” is currently visiting, we processed three and half dozen olive ridleys; he’s in good company.

Post STAR, I will evaluate trophic relationships between ETP olive ridleys and their prey by looking separately at the collected stomach contents and tissue samples, and then comparing the two. I will identify prey items in the stomach content samples; furthermore I will look at the isotopic signatures of elements such as carbon and nitrogen in the olive ridley blood and skin samples, as well as in collected samples of their potential prey animals. This will provide information to create food web links. Stable isotope abundances in olive ridley tissues will shed light on the assimilated olive ridley diet over time, as different tissues have different growth rates. Stomach contents provide a snap shot of the turtle’s diet over only the last day or less. This investigation will give insight into the role and importance of olive ridleys in the ETP ecosystem.

Species	Common name	Number sampled	
		Weekly	Total
<i>Caretta caretta</i>	Loggerhead	0	8
<i>Eretmochelys imbricata</i>	Hawksbill	0	1
<i>Lepidochelys olivacea</i>	Olive ridley	0	172
Total		0	181

Fish Sampled for Diet and Isotope Analysis

Species	Samples	
	Weekly	Total
Yellowfin tuna	0	22
Skipjack*	0	13
Wahoo	1	4
Mahi mahi	3	14

*includes black skipjack

Oceanographic Operations (Candy Hall)

Kessler (2006) has recently written, “The wind forcing associated with the ITCZ between the two subtropical highs produces the long ridges and troughs that bound the zonal currents of the central Pacific... East of 110° W this ridge–trough system breaks down, allowing meridional [north <--> south] flows and strong zonal [west <--> east] gradients of both winds and currents, with southerly cross-equatorial winds and a complex system of currents that exchange mass meridionally”. Both of these statements have rung true for us this week as we oscillated between

an offshore branch of the Costa Rica Coastal Current and the North Equatorial Countercurrent (possibly dipping into the Northern Subsurface Countercurrent). Our importunate winds, peaking at 50, and averaging 32, knots, have finally shifted from their predominately northerly direction as we head toward the Americas and the ‘Tehuantepec Bowl’ (more about that next week!).

Nonetheless, oceanographic operations have continued unthwarted, documenting ~ 28 °C surface temperatures and ~ 33 psu salinity values; at-depth and surface chlorophyll mass and *in situ* vertical thermo- and halocline profiles. The ADCP (Acoustic Doppler Current Profiler) continually logs the currents, while the EK500 acoustic echosounder tallies the target strength of all that passes below. Not to be forgotten, the pCO2 system is merrily chugging along, testifying to the carbon dioxide diffusion process between the water and the air.

To leave you with Hugo Vihlen’s quote that sums up how the mammal observers must have been feeling on this week’s infrequent big-eye forays, “I don’t know who named them swells. There’s nothing swell about them. They should have named them awfuls!”

Date	CTD	XBT	Bongo tow	Manta tow
12 Oct	2	3	1	1
13 Oct	2	3	1	1
14 Oct	2	3	1	1
15 Oct	2	3	1	1
16 Oct	2	1*	0	0
17 Oct	2	3	0	0
18 Oct	2	3	1	1
Total	14	19	5	5
Grand Total	120	197	47	51

* High winds allowed for port engine maintenance, necessitated the deployment of only one XBT (sampling stipulation of over 10nm between stations - 13.5mn between am CTD and 12h00 XBT station).

Reference:

W.S. Kessler, W.S.2006. The circulation of the eastern tropical Pacific: A review. *Progress in Oceanography* 69: 181–217.